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Non-VUV luminescence of liquid and gaseous argon

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Modern particle detectors based on liquid and gaseous argon are designed to detect scintillation light in vacuum-ultraviolet (VUV) regime. It is known however, that luminescence at longer wavelengths takes place, in visible part of the spectrum and up to the near-infrared (NIR).

Studies of argon scintillation in various spectral ranges are being performed at Fermilab, specifically focused on scintillation processes in low temperature argon gas. The latter is less studied than liquid phase, but relevant for various experimental situations in the current and planned argon TPCs, for example ground-based prototypes, where light emission from the interactions in the gas ullage volume may be significant.

A recent experiment involves an Am-241 alpha-source and three photosensors with sensitivity in different spectral ranges. Data analysis results confirm significant fraction of argon luminescence in visible part of the spectrum and possibly in NIR

New data on the argon scintillation dynamics will help theoretical understanding of the underlying processes and their modeling, which might lead to advancements in the design of argon TPCs, with improved light collection and possibly particle identification.

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